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SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

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FRIDAY, OCTOBER 17, 1902.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE CARNEGIE INSTITUTION.

TO THE EDITOR OF SCIENCE: I certainly appreciate your kind letter inviting me to join with you and others in publicly discussing in the columns of SCIENCE the question of the endowment of scientific research with special reference to the possibilities which are wrapped up in Mr. Carnegie's recent gift to the institution in Washington. Without such an invitation coming from you I should have hesitated to give utterance to any of the thoughts which naturally have arisen in my mind in this connection. I feel delicacy in making suggestions touching matters in reference to which my opinion has not been solicited. But when the editor of SCIENCE asks me to speak I cannot refuse to comply with his request.

There is but one truly scientific mind in the universe, whose vision sweeps from Sol to Alcyone, which notes the sparrows as they fall, and numbers the hairs of our heads. Every effort of the human intellect to ascertain the unknown as to the whole of things is an effort to apprehend the thought which lies in the great Synthetic Mind. As a philosopher I have long ago been taught the folly of calling anything great or anything little which Infinite Wisdom has planned and called into being. Nothing knowable is in certain aspects fundamentally more important than

any other thing which is knowable. When the astronomer undertakes, with the refinements of modern instrumental equipment, to photograph the visible heavens from pole to pole, to count the stars, and, if not naming them, to at least give them numerical designations, I respect his work, little as it bears to-day upon the practical life of man, because it is taking him and with him all mankind into communion with the all-creative Spirit. And when a friend of mine sits down to count the number of feathers which grow upon the belly of a duck, or another to trace the origin of the phylæ of the insect world through the bristles on the backs of larvæ, I feel for him in his laborious researches as profound a respect as I do for my astronomical friends with their vast and costly equipments. A fund given for the promotion of scientific research if well administered must be administered in the full consciousness of the fundamental fact that all knowledge is important and that all the sciences are but so many facets which bound the white diamond of eternal truth. The point which I mean to make is simply this, that the administration of a great fund like that established by Mr. Carnegie will ultimately fail of its aim unless those who are charged with the work are broad, learned and wise enough to avoid discriminating unduly in favor of one set of scientific investigators over against others. All the sciences should be treated impartially, and every honest worker seeking to add something to the sum of human knowledge should at least be treated sympathetically and aided, if possible, in the accomplishment of any feasible task. To devote the income of this great endowment to the promotion exclusively of a few things, the friends and advocates of which may be potent in argument, and influential by reason of personal acquaintance with those who are the administrators of the trust, would ultimately create in the minds of multitudes serious dissatisfaction. If I understand the attitude of the generous giver of this endowment it is an attitude of thorough impartiality toward the friends and advocates of scientific progress everywhere throughout the land.

In common with yourself, in view of what I have said I fear the result at the outset of the assumption by the Carnegie Institution of the control of existing agencies for research and for the education of students in research. To take up a few existing institutions and put them upon a satisfactory basis would be comparatively an easy matter, but such a course would inevitably in the end tie up the fund to the continued maintenance of such favored institutions, and the broader helpfulness of the fund would very probably be ultimately greatly impaired. Had I any voice in the administration of this fund I would plead for the avoidance at the outset of 'entangling alliances,' but I suppose that the wise men who have been selected to manage the affairs of this institution in Washington cannot fail to see the importance of this point.

As to various schemes which have been suggested of creating in the city of Washington an institution equipped with buildings and laboratories for the prosecution of special researches, I am inclined to think that such a course is, in view of all that already exists, of very doubtful expediency. There are already so many agencies for research at work which are not accomplishing all that might be expected from them, in many cases because of lack of sufficient resources, as to make it doubtful to my mind whether the creation of another supplementary piece of machinery promises as much as the application of lubricant to machinery already in existence. What is needed for the advancement of American science it seems to me is not multiplication

of agencies, but the nourishment and upbuilding of those which already exist. I say, without any fear of being successfully controverted, that there are already in America quite enough colleges, universities, scientific societies, laboratories and associations of scientific men. Scientific men should learn wisdom from men of affairs. This is the age of consolidation, in which the importance of union in effort is recognized. Plans now outrun accomplishment. Schemes for the accomplishment of the possible outnumber potent actualities. A hundred dream where one man acts. The land is full of abortive enterprises. The Carnegie Institution will do good just so far forth as it serves to be the fountain from which life-giving power shall be poured into those things that need strengthening lest they die. With this fund to create an institution which, by reason of its magnificent endowment, shall simply eclipse all others as the seat of original research, would, if I understand the views of the donor, fail utterly to carry out his intention. The attitude of the Carnegie Institution, if I understand the thought of the founder, is to be that of the gracious handmaid of learning, intelligently ministering to those who need, and without such agency could not have, help.

As everybody knows, the donor of this fund had in his mind not so much institutions as individuals. His thought could not be more felicitously expressed than he has himself expressed it in the words which you quote, in which he states the main object of his foundation to be 'to discover the exceptional man in every department of study whenever and wherever found, inside or outside of schools, and enable him to make the work for which he seems specially designed his life work.' Mr. Carnegie's large knowledge of men has taught him that there are 'exceptional men,'—very often men poor in purse, but rich in enthusiasm and in mental power, who need but the helping hand to enable them to achieve great things, not only for themselves, but for mankind, and nowhere are such exceptional men more numerous than in the ranks of the scientific investigators of this country. They would not be scientific investigators were they not possessed of power and filled with the love of truth. Even as I write I can think of a score of such men, who are struggling in the midst of adversity and prevented by the *res angusta domi* from achieving tasks the doing of which would bring luster upon their names and honor to the nation whose sons they are. Such men deserve to be helped, and in helping such men the Carnegie Institution will place the highest crown of glory upon its head. To hold the Institution more or less rigorously to this phase of activity seems to me to be the plain duty of those who are charged with its administration.

A few quite practical and concrete suggestions based upon personal experience as to the manner in which this fund might be utilized to promote the advancement of science in America in cooperation with existing institutions may not be wholly out of place. I am emboldened to throw out these suggestions by your example, seeing that you have appealed to your own experience in your own line of special research.

In order to enable scientific men to work rapidly and successfully to their ends, especially in the field of the biological sciences, it is of prime importance to them to have access to collections which embody in themselves the results of the investigations of those who have gone before them. This is particularly true in mineralogy, botany, and zoology in its various branches. When a student has devoted himself to the study of one of these branches of science and has, by years of

labor and effort, amassed collections which are determined with absolute scientific correctness, and which contain the 'types' upon which he has founded his published descriptions, these collections become at once classic as a court of last appeal in all cases of doubt. The retention of such collections, especially when they relate to the mineralogy, botany and zoology of a country, within easy access of the students of that country, is a matter of incalculable importance. American science has suffered severely in past years because of the failure of American institutions, often because of lack of money, to keep within the limits of the United States scientific collections, reference to which on the part of the student is necessary. The most eminent student of certain groups in entomology in this country a number of years ago was Alexander R. Grote, to-day connected with the Roemer Museum at Hildesheim. Mr. Grote was the first man who began systematically to study the moths of America and to name and describe them. His 'types' were contained in his collection for the most part. Pressed by financial necessities, Mr. Grote sold this collection to the trustees of the British Museum. The consequence of this fact is that to-day pilgrimages are annually performed across the Atlantic Ocean at considerable expense of time and money by American students in order to consult this classic collection. The trustees of the British Museum, I believe, paid something like three thousand dollars for the collection. I am aware that American students of entomology have already spent out of their private purses many times this amount in traveling across the seas to consult it. A few years ago the great collection of William H. Edwards was on the point of going in the same way. Personally I determined to save it for the students of America, and I purchased it myself, and it is to-day accessible in the Carnegie Museum. One function of the Carnegie Institution, it seems to me, might well be to aid the great reference museums of America to retain within easy reach of our scientific workers collections of this character, the loss of which to the land is practically irreparable. As a rule such collections are not vastly expensive, but their loss to the American student is a positive calamity, and I trust that the trustees of the Carnegie Institution will make it a point to cooperate with the heads of our great museums in preserving for the students of American science the types of all American species. Nothing more positively beneficial in the direction of the advancement of science could be done than this, as I am sure all botanists and zoologists will agree with me in unanimously declaring.

Finally, I wish to assert my unqualified subscription to your statement that the Carnegie Institution should do only that which will not conflict with existing institutions, but aid them, and secondly, should aim to improve the condition of men of science, working with them and through them. The only men in this connection whom we have to fear are, I think, the class whom I am pleased to call the 'political scientists,' the men who look upon scientific positions as 'jobs.' There are a few such men, to the honor of science be it said not many.

W. J. Holland.
Carnegie Museum, Pittsburgh,
September 23, 1902.

To the Editor of Science: It may as well be conceded first as last that the Carnegie Institution will have a definite location. However much any of us might wish to see the experiment made of a great institution managed from an obscure little office on a side street, it is extremely unlikely that any such thing will be done. The Institution must have office and other

rooms for the transaction of its business. These should be commodious, and adapted to the needs of the officers, and the building as a whole should have a dignity commensurate with the rank of the Institution. In the second place, I venture to say that the Institution must be a *unit*. Neither its founder nor its managers are likely to consent to a policy which will result in such subdivision of the income as will fritter it away in many ineffectual driblets. There is not enough money to endow research along many lines. It is impossible to endow scientific journals, support marine and other laboratories, aid considerable numbers of worthy individuals, and conduct original investigations along several lines. Many people have been dazzled with the size of the principal, and talk as if the ten millions of dollars *were available annually*, forgetting that it is only the income from this sum which is available. This income, after all, is not so very large. Already many of the universities of this country greatly exceed it.

Evidently the work undertaken must be definitely limited. It must be concentrated upon certain phases of investigation and instruction, and in this way it may hope to aid the progress of human knowledge. It seems to me that many of the suggestions as to the policy to be pursued by the trustees of the Carnegie Institution fail in that they appear to be based on the supposition that it is to be over and above all existing ones—a sort of supreme educational establishment of the university type. Yet it can be no such thing. Had the fund been ten times ten million dollars, the Carnegie Institution might have overtopped Harvard, Yale, Columbia, Chicago, Stanford and all the rest of the universities of the country. But it is idle to think of any such thing with the income which the present fund will yield.

What, then, can be done? Clearly the trustees should avoid duplicating what is already fully provided for in existing institutions. In the institution which they establish they should contribute something to education and educational thought. The Smithsonian Institution taught us the value of original research, and its 'Contributions to Knowledge' will stand for all time as evidence of the high standard set by it. Johns Hopkins University has made one contribution of the greatest importance —namely, graduate study in the American University. It may be said to have fixed the standard of graduate work, and every educational institution in this country has been helped by its example.

Now let the Carnegie Institution set for itself one good piece of work, and concentrate upon that, rather than fritter away its income in many little benefactions, all more or less worthy and commendable, but already under the care of some other institution.

I suggest, therefore, that the trustees found an 'Institute,' which shall carry the work in some rather narrow department of knowledge far beyond the boundaries possible to be reached by university departments. It is impossible to support a great university by the income from this bequest, but it is possible to maintain an 'institute' devoted to some branch of investigation. This might be a chemical institute, a physical institute, a zoological institute, a botanical institute, a geological institute, a physiological institute, a pathological institute, a psychological institute, etc. I cannot decide which of these should be inaugurated; that may well be left to the trustees and the president of the institution. Let me suppose (since I am not a chemist, and therefore am not pleading for my own subject) that the decision is to found the 'Carnegie Chemical Institute'; we might then hope to have in it the best facilities known for the solution of chemical problems. Here

might be brought as professors some of the foremost masters of the subject in general, as well as many specialists in particular fields of the science. Here might be admitted as students such men as have made marked progress in advanced lines of work in the better universities, and who are prepared to continue work in the institute. I should not favor free tuition, nor the establishment of stipend-bearing fellowships. On the contrary, I should favor the policy pursued at Johns Hopkins University of making the usual charge for tuition. Men who are prepared to continue work in the institute always will be able to pay the usual academic fees. Fellowships carrying stipends would no doubt attract students, but it is not numbers which the institute wants, as much as students of the highest ability—and such rarely, if ever, need to be induced to continue work by the promise of a stipend.

With one well-endowed institute in Washington on the Carnegie foundation, we might hope that ultimately the several sciences would be similarly provided through the benefactions of liberal-minded men of wealth. These institutes would then be for the present the highest development of the educational facilities of the country, in these lines, and the successive steps in the system would be as follows: Primary schools, secondary schools (high schools and academies), colleges, universities, institutes. In these there is a constantly decreasing number of students, who proceed in their educational development from the general to the special—from the universal to the limited. It is for the limited number of specialists who have come up through all the preceding steps that the institutes should exist. I suggest, therefore, that the trustees inaugurate an institute of this highest grade.

Charles E. Bessey.
The University of Nebraska.

There is undoubtedly a great work to be done in starting local investigators through correspondence. I have always, during a number of years, had several such men on my list—have hunted references in works they did not possess, gone over their MSS., suggested lines of investigation, and so forth. The result has on the whole been most gratifying. These men have not always been isolated in the ordinary sense of the word; not rarely they have been graduate students in our best colleges and universities. I need hardly say that I have received much help of the same kind. I believe that any man who is familiar with a particular branch of study can do this sort of helping work, and that it is extremely worth while. But of course it brings no pay, and it could, I think, very well be subsidized in some way.

There are many good investigators scattered about the country, who don't accomplish anything for lack of help and kindly criticism. Often the mere fact of not having some expensive work seems to put a stop to an investigation. But the specialist of long standing can look up references and take away this difficulty. To merely offer the beginner money would not meet the case at all; he needs guidance.

Please understand that I *don't* propose a plan whereby young men may have their work done for them. Directly they show a desire to build their 'researches' out of other people's brains they should be dropped. But this does not apply to those who are really doing all they *can* and are hindered by circumstances beyond their control. Frequently the circumstances are such that the work can only be brought to a fruitful state through a good deal of cooperation; then the published results should indicate the fact, and the two or more names appear on the title page.

I think some special regard should be had for the thinly settled parts of the

country. In these regions we find, (1) that the scientific men are extremely few, (2) the means for their support are still fewer, (3) and that there is a superabundance of opportunities for study. In New Mexico I am the only zoologist, so far as I know (unless the paleontologists Springer and St. John are regarded as zoologists*). There is no support of pure science anywhere in the territory. Yet the opportunities for research are innumerable. (Of course they are so anywhere, but there are so many almost or quite virgin fields in New Mexico; so many whole groups of animals unstudied, whole mountain ranges unexplored by the biologist.)

My ideal is to have the means to invite a dozen or more young men (or women) out here to take up some of the lines of work I see open in every direction. I try to do what I can, but the things I *can't* do are never out of my mind.

I think your remarks on the subject of publication are very wise. This is a subject of the first importance. In zoology and botany great good could be done by publishing catalogues, bibliographies, etc. For example, I understood that Mr. S. Henshaw, of the Mus. of Comp. Zool., has in MSS. a work giving references to the whole of the literature on North American Coleoptera, with localities. I understand that he cannot find any one to publish it. It would be simply invaluable to the student of geographical distribution and to the coleopterist.

Faunal works also deserve support. I believe Dr. J. B. Smith, of New Jersey, stands ready to publish a work on the noctuid moths of North America, if any one will relieve him of the cost of printing.

I hope, however, that the Carnegie Institution will give us most of its publications at reasonable prices and with as little paper as may be needful for good printing. The bulky quartos so often published are quite too costly and too heavy to carry about.

These remarks are of course only meant to cover a small amount of ground, in which I happen to be interested. I have no disposition at present to discuss the Carnegie Institution as a whole.

THEO. D. A. COCKERELL.

* C. L. Herrick has formerly published on zoology, but is not now working on this branch.

THE problem before the trustees of the Carnegie Institution is not simply that of the profitable administration of the fund in the promotion of research—this would be easy enough; but it is to secure the greatest possible enlargement of the bounds of human knowledge from an income, which, large though it seems, is but small in comparison with the amount being spent upon research the world over. Now there is but one well-spring of new knowledge, and that lies in certain rare individual minds with an inborn aptitude, needing to be supplemented by a special training and a favorable environment, for scientific research. Knowledge is advanced in depth, if not in breadth, far more by the single occasional genius than by many lesser minds. To find out, and especially to give full play, to these few rare minds, seems to me the true ideal of the Carnegie Institution, and the object to which the greater part of its fund may most profitably be devoted. There are two ways, practically, along which to work towards this end. First, wherever there is known to be a man who had proven a marked capacity for research, but who has been forced by circumstances into an unfavorable environment, he should be offered a stipend, not lavish, but ample for the support of himself and family in ordinary comfort, to enable him to remove for a year or two to any center of research he may choose; if then his work goes well, he should be granted a second

year, and a third, and, finally, if it seem profitable, even a lifetime. Second, the Carnegie Institution should take up trained and promising young investigators where our universities leave them. The university is the natural and efficient, though by no means the exclusive, selection and training ground for investigators; it is in the ability to permit these men to continue their investigations that our American universities are weak, and need to be supplemented. A few of the best of these young men, the ones most highly recommended by the faculties of the leading universities, should be offered stipends large enough to permit them to live in comfort at any center of research they may select, for a year, or for two, or for three, or for a lifetime, according as their results show to be profitable. From the many called to a year or two of such honorable activity few would be chosen for a lifetime, but those few would form a priceless possession to humanity.

To provide a favorable environment for minds adapted to research seems to me, therefore, the best use for the greater part of the Carnegie fund. But, second to this, there are certain other profitable uses for a part of it—the purchase or construction of apparatus for use in promising investigations by private investigators, grants to scientific expeditions or in aid of bibliographies, subsidies to investigating laboratories and to scientific publications, and many minor worthy objects of like sort.

There are two uses to which I think none of the funds of the Carnegie Institution should be put. First, they should not be used to duplicate any existing institutions for research, and especially not for the erection or purchase of laboratories of any kind in Washington or elsewhere. In this country, it seems to me, our material facilities for scientific research already far exceed our capacity to utilize them profitably. In botany, for example, the development of institutions is out of all proportion to the importance of the results which are coming from them. The Missouri (Shaw) Botanical Garden, the New York Botanical Garden, and in lesser degree several other institutions, are offering freely to all investigators facilities for botanical investigation which money can hardly improve upon; what is now wanted is not more such institutions, but more men capable of making proper use of them. I cite botany because I know it better than the other sciences, but I presume the same is true in this country of most, if not all, of the other sciences. To duplicate facilities not already fully utilized would be most wasteful. There is, moreover, another reason why I think the Carnegie Institution should not own any laboratories of its own, including such an one as that at Woods Hole, namely, the temptation to aggrandize those particular laboratories would be so great, and the capacity of any laboratory in the endlessly expanding sciences to absorb money is so nearly boundless, that all of the fund available for each particular science would in time, if not soon, be absorbed to that particular use, and other objects, however worthy, would be no better off than at present. Second, the funds should not be used for any form of gratuities, rewards or prizes, or to pay to investigators salaries or stipends larger than needful for comfortable living and the successful prosecution of their researches. Prizes have their uses in the lower grades of intellectual activity, but to suppose that pure scientific research of the highest type is appreciably promoted by them seems to me to involve an erroneous idea of the mental attitude of the investigator towards his results. At all events the utility of such rewards is, on the one hand, not demonstrated by the history of scientific progress, while, on the other, the efficiency of prizes is being ex-

perimentally tested on a gigantic scale by the Nobel bequest, and the Carnegie Institution can well afford to await the results. I take it the chief reward of the genuine investigator consists in the accomplishment of the work itself, in the moments of exhilaration when truth new to the race first dawns upon him, in the approbation of his peers. If he does not do the best there is in him for these, he will not do it for the trappings which a salary larger than needful for comfortable living will enable him to buy.

The wisdom of devoting the most of the funds of the Carnegie Institution to the selection and cultivation of individual investigators seems to me the more important in view of the fact that Americans appear to be weak in the investigating instinct, or temperament. The genius of the American people is rather for affairs than for that patient persistent microscopic application which is the soul of research. It is all the more needful, then, to seek out and cultivate such investigating talent as there may be. To suppose that it is money alone that is now needed to give this country the primacy in research is to share the attitude of the man who, become suddenly rich, said to his son, 'My son, we are now very rich and you can realize your ambition to become an author; yes, we are rich enough so that if you wish you can become a great author.' It will call for much from the Carnegie Institution besides its great income to make this country great in profound scientific research.

I think, therefore, that the highest usefulness of the Carnegie Institution will lie in acting as a special providence to men, institutions and events, concerned in the advancement of human knowledge. As such it must be content with the rewards of the spirit, and willing to forego structures and furnishings visible to the physical eye, which in this case should be so much the easier for the reason that the munificent founder of the Institution is already amply honored in the many sightly and serviceable structures with which the land so happily abounds. W. F. GANONG.

SMITH COLLEGE,
NORTHAMPTON, MASS.

I SUPPOSE that every scientific man, who has at any time been hampered in his work by lack of funds—as which of us has not?—allowed himself, when he heard of Mr. Carnegie's millions, to dream of what could be done, with unlimited money, for his own science. My own thoughts turned at once to the building and equipment of adequate laboratories of experimental psychology. For we psychologists have no laboratories that can at all compare with those of physics or chemistry or biology, or that at all worthily represent the range and complexity of our science. The student of physics, at any one of the larger institutions, is impressed as he enters the laboratory with the dignity and importance of the work before him; physics is largely housed and richly equipped. It is very different with psychology. An old building that has outlived its original usefulness, a private house that the university does not need, a set of rooms in the corner of some building devoted to miscellaneous purposes—these are our laboratories. No museum rooms for the display of historical instruments; no private laboratories for the instructing staff; no proper separation of teaching and investigation. What I should most of all like to see, then, is a special laboratory building, specially designed for psychological ends, adequately officered, and ample enough to accommodate all the many branches of psychological work. It would not much matter where the building was placed, provided that it existed, and were reasonably accessible. Once a model was made, improvement would follow all round.

I realize, however, that psychology has more immediate and pressing needs, that can also be more easily satisfied. First among these I should place the need of help in publication. There can be no question, as Professor Cattell has said (Science, September 19, 464), that the present difficulties in the way of publication are lamentable. Every year we have, in my own laboratory, to make some sacrifice to the cost of printing: dropping out an historical chapter here, cutting out tables there, and what not. We all know, of course, that the doctorate thesis is likely to be spun out to an unnecessary length; and I am not sure that the fulness of detail affected by certain of the continental journals of psychology is not a distinct hindrance to the science. But it is an indisputable fact that, in America, really good work, work that has been condensed to its limit and that ought to be published, is time and time again held back from the printer because the author or the journal is too poor to print it. Hence I heartily endorse all that Professor Cattell has said under this heading.

In the second place I should put the need of scholarships and fellowships, and of subsidies to students and professors. There is much to be said for and against our present system of graduate scholarships. One thing must, however, be borne in mind: that the appointment of a man, in his last undergraduate year, to a graduate scholarship always carries with it something of a risk. Undergraduate promise is not always fulfilled, and testimonials are slippery things. So that the number of scholarships available for a particular science should be large enough to allow of a good percentage of failures. Failures, I mean, from the point of view of the science; for any man of decent intelligence must be helped towards his life-work by a year of graduate study, whether he continue it further or not. If the science is ultimately to get a fair share of good men, it must have a large number of students to select from. I should, therefore, see no harm, but rather good, in an increased number of graduate scholarships and fellowships. But I regard two possible modifications of the existing system as more important than its mere enlargement. On the one hand, we need at each university a few really valuable fellowships, say of $750 or $1,000 for two or three years; endowments that should allow the exceptional man to do an elaborate piece of investigation before he enters on his teaching career. And on the other, we need, I think, a certain fund for subsidies that should not be looked upon as university honors, but should simply give opportunity of graduate work to men who are too poor to undertake it on their own account and yet too promising to be let slip: subsidies of, perhaps, $300 or $400 for one year. I believe that both of these forms of endowment are sorely needed by psychology,—and one can speak primarily only for one's own science; and I believe that they would do much more good than the establishment of additional scholarships on the present basis.

I have put the student before the professor. I regard, however, the helping of the professor by occasional subsidy as of equal importance with the helping of the graduate student. My colleagues will bear me out that there are often times when a gift of $500 or $1,000 would ensure the accomplishment of a bit of personal work for which one is reluctant to draw upon the general fund of the laboratory, even if the general fund would stand the drain. There has been some discussion in Science of the reason for lack of appeal to existing research funds. There are two obvious reasons. The one is that the professor, with the pressure of teaching and of routine departmental work upon him, cannot as a rule see his way clear enough ahead (say, for two or three years) to justify his asking for a

definite sum for a definite purpose; and the other is that though one may see where work needs to be done, where there is a promising opening, one cannot (I speak again for psychology) guarantee results or even formulate one's program until the investigation is well started. Nevertheless, scientific moneys can hardly be placed in better hands than in those of men whose lives are devoted to science, and who have proved their competence by their own work and by that of their pupils.

In summary, then, I should advocate: (I.) increased facilities of scientific publication, and (II.) scientific endowments of three kinds. These are (1) the establishment of a few valuable fellowships; (2) the granting of a living wage for one year to men of promise; and (3) the unhampered gift of sums of money to men of scientific eminence —passed upon, perhaps, by a committee of their peers—on their personal guarantee to do with the gift what it lies in their power to do for the advancement of science.

E. B. TITCHENER.

CORNELL UNIVERSITY.

IN response to the general invitation and a special request from the editor of SCIENCE, it is a pleasure to suggest two or three lines of policy which seem worthy of consideration.

It may be premised that the suggestions grow out of the express intent of the founder to promote science by affording opportunities for men; and it may be noted in passing that this intent is so far distinctive as to permit the development of an institution occupying an essentially unique plane: It is the function of the university to mold men according to the image; it is the function of the official bureau to have ready-molded men mold and apply knowledge according to accepted standards; but it would seem to be the Carnegie idea to permit and help men to mold both themselves and knowledge in the light of their own genius as well as in that of current experience—an idea precisely in line with the course of human development as seen by the anthropologist. In conformity with this idea, it would seem clear that the new establishment should scrupulously avoid fields already occupied by universities and colleges on the one hand, and by federal and state bureaus of scientific character on the other hand; and it would seem to follow, as already pointed out by Professor Cattell, that the new institution should dispense with plant and other material encumbrances to the fullest possible extent. The suggestions are made in accordance with this view.

1. The first suggestion (which is but a repetition of one made by Professor Cattell) is that the purposes of the founder be carried out largely through the creation of fellowships in special lines of research. It may be added that the lines of work should be adapted to the ambitions and capabilities of particular candidates or nominees for fellowship, and that novel lines of inquiry should be tolerated no less kindly than the conventional lines pursued in the purely educational institutions. The fellowships might be either fixed or variable, or might be graded, *e. g.*, at $600, $1,000 and $1,500; but in any event the financial measure should be determined by the primary object of the Institution, *i. e.*, that of giving the *man* an opportunity of pursuing knowledge. The fellowships might properly continue over two, three or five years, but should not be regarded as permanent.

2. The second suggestion is that every fellow should be allowed and expected to gain distinctive permanent recognition for excellent work in his special line, in the form of some honorary degree or designation. A single order (which might be styled master) might suffice; while the classes

should be special, unlike those conferred by institutions of learning, and determined by special work. Thus, there might be masterates of agriculture, of paleontology, of terrestrial physics, of mineralogy, of entomology, of ethnology, etc., but not of arts, or philosophy, or laws, or science. The degrees should be special, the well-earned reward for special work; they should be credentials rather than titles; and the number of classes should be unlimited, in conformity with the modern multiplication of specialties as well as the fundamental idea of developing individuality—of making men rather than schoolmen. The masterates should, of course, be permanent, and should not involve financial relations with the Institution—*i. e.*, masters should be neither entitled to, nor debarred from, support by the Institution.

The terms 'fellow' and 'master' are not without objection, chiefly on the score of current use in other connections; they merely serve the purpose of these suggestions. The two classes would correspond roughly with the apprentices (or perhaps rather the journeymen) and masters of an important stage in industrial progress; they would seem to bridge and unite the two great buttresses of human advancement, *i. e.*, the intellectual development of the schools and the manual development of the shops.

The advantages of the masterates would be twofold: In the first place, they would afford incentive and stimulus to hard-working fellows; in the second place, they would form a permanent bond between the Institution and its beneficiaries and among the beneficiaries themselves, producing an *esprit de corps* by which the usefulness of the Institution would be most effectively extended and perpetuated.

3. The third suggestion is partly an extension of the second, partly the outcome of current needs. Among the means of promoting science in this and other countries, conferences among scientific men take a high if not the leading rank; and the demand for such meetings has been met by the creation of a large number of voluntary organizations. In this country, at present, there is a tendency to form special societies of national character (such as the American Chemical Society, the Geological Society of America and the American Anthropological Association), and more general societies or academies of largely local membership; and the effect is to increase the need for such more general organization among scientific societies as will lead to better coordination of effort among scientific workers. It has already been pointed out that this great and growing need would be met by a general delegate organization which might be called a Senate of Science (Science, Vol. XIV., pp. 277–280), and it was also pointed out that the chief obstacle in the way of organization of such a body would be the cost of the requisite journeys by delegates. Now it would seem appropriate for the Carnegie Institution to become a nucleus for such a general scientific organization, to be made up of delegates chosen for fixed terms by the scientific societies of the country, and to be maintained for the purpose of fostering and encouraging scientific activity; and that a fraction of the current funds available through the munificence of the founder be so expended as to place all delegates on an equal footing by the payment of necessary traveling expenses to the points selected for the meetings. Such an arrangement would undoubtedly kindle the interest and sympathy of scientists and scientific associations generally, and, like the establishment of masterates, serve to extend and perpetuate the influence of the Institution.

The foregoing suggestions of course imply the creation and maintenance of an executive mechanism with the least prac-

ticable expenditure for material or administrative purposes, and with the idea of allowing the light of a noble institution to shine afar, to enter the darkest corners of the land, to stir dormant genius everywhere, to awaken every germ of scientific activity.

W J McGEE.

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*PROFESSIONAL SCHOOLS AND THE LENGTH OF THE COLLEGE COURSE.**

STANDARD OF ADMISSION TO THE PROFESSIONAL AND TECHNICAL SCHOOLS.

I HAVE pointed out that it is held to be settled policy at Columbia University that the several technical and professional schools shall rest upon a college course of liberal study as a foundation (although not necessarily upon a course four years in length), either at once or as soon as practicable. The School of Law has already been placed upon the basis of a graduate school, to take effect July 1, 1903. On December 20, 1898, the University Council recommended that the College of Physicians and Surgeons be made a graduate school as soon as such a step is financially practicable. The Schools of Applied Science have constantly in mind a similar step, and much consideration has been given by the faculty to the best way of bringing about the change without undue sacrifice. This policy, however, does not pass unchallenged. It has recently been criticised and opposed in a cogent and noteworthy argument by President Hadley, of Yale University, in his annual report for the year 1901–02, on the grounds (1) that it tends to make the professions exclusive in a bad sense, (2) that it leads to a remodeling of the college course to meet the needs of intending professional students, which remodeling is at least a doubtful experiment, and (3) that it establishes an unfortunate distinction between the universities which require a bachelor's degree as a condition of admission to the professional schools and those which make no such requirement. This policy is also criticised and opposed by many intelligent persons, trusted leaders of public opinion, not university teachers or administrators, who are impressed by the fact that the whole tendency of our modern educational system is to prolong unduly the period of preparation or studentship, with the result that an increasing number of young men are held back from active and independent participation in the practical work of life until they are nearly, or quite, thirty years of age. In the face of such objections as these it is obvious that we at Columbia must consider carefully the probable social and educational effects of the policy upon which we have entered.

The questions raised in the discussion of this policy are to be decided, it seems to me, from the standpoint of the duty of the university to the public and to its own educational ideals. Two interests are immediately at stake: the standards of professional study in a university, and the place of the American college in the higher education of the twentieth century. I doubt whether the two interests can be separated in any adequate consideration of the subject.

President Eliot, of Harvard University, impressively set forth the responsibilities and the opportunities of the learned professions in his address at the installation ceremonies on April 19 last, when he said:

> It is plain that the future prosperity and progress of modern communities is hereafter going to depend much more than ever before on the large groups of highly trained men which constitute what are called the professions. The social and industrial powers, and the moral influences which strengthen and uplift modern society are no longer in the hands of legislatures, or polit-

* From advanced sheets of the annual report of President Butler to the trustees of Columbia University.